SAMSUNG
ELECTRONICS

Customer : Pusheng   **DATE : 08.Jan.2008**

SAMSUNG TFT-LCD

MODEL **: LTA320WT-L05**

Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's Approval		APPROVAED BY *Kyunghwan Ko*	DATE 08.Jan.2008
SIGNATURE	DATE	PREPARED BY **Yongsun KIM**	DATE 08.Jan.2008

LCD Business

Samsung Electronics Co . , LTD.

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Revision History

Date	Rev. No	Page	Summary
Feb 2, 2007	05.000	all	First issued
Apr 11, 2007	06.000	all	Version revision

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General Description

Description

 LTA320WT-L05 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 32.0" is 1366 x 768 and this model can display up to 16.7 million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle (±178°)
- High speed response
- HD resolution (16:9)
- Low Power consumption
- Direct Type 12 CCFLs (Cold Cathode Fluorescent Lamp)
- DE(Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface (1pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	760.0(H_{TYP}) x 450.0(V_{TYP})	mm	±1.0mm
	48.0(D_{MAX})		
Weight	7,500 (max)	g	
Pixel Pitch	0.51075(H) x 0.51075(W)	mm	
Active Display Area	697.6845(H) x 392.256(V)	mm	
Surface Treatment	Haze 44% , Hard-coating (3H)	-	
Display Colors	8 bit - 16.7M	colors	
Number of Pixels	1366 x 768	pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	500 (Typ.)	cd/m²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	GND-0.5	*5.5*	V	(1)
Storage temperature		T_{STG}	-20	60	℃	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	℃	(2),(5)
	T. Uniformity	△T	-	10	℃	
Shock (non - operating)		S_{nop}	-	50	G	(3)
Vibration (non - operating)		V_{nop}	-	1.5	G	(4)

Note (1) Ta= 25 ± 2 ℃
    (2) Temperature and relative humidity range are shown in the figure below.
       a. 90 % RH Max. (Ta ≤ 39 ℃)
       b. Relative Humidity is 90% or less. (Ta > 39 ℃)
       c. No condensation
    (3) 11ms, sine wave, one time for ±X, ±Y, ±Z axis
    (4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis
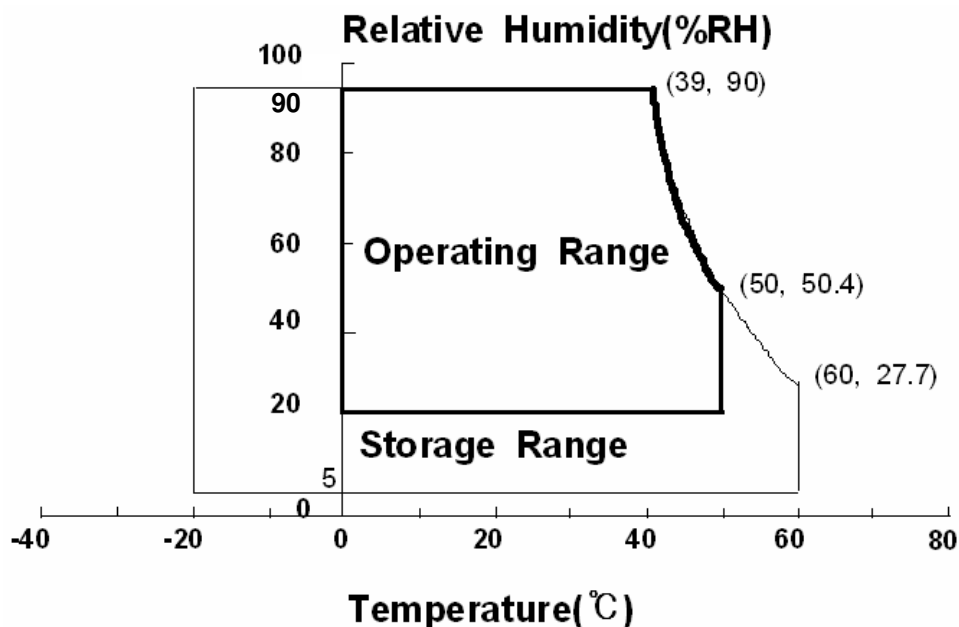
Fig. Temperature and Relative humidity range

(5) Definition of test point
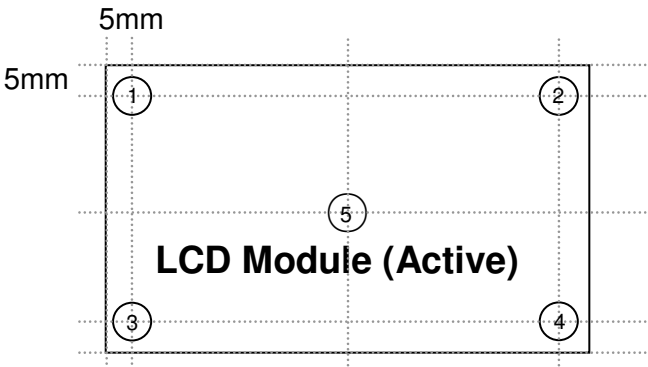
$\triangle$T should be less than $10\ ℃$ ($\triangle$T = | T_{OPR} − T_{MAX}|)

T_{OPR}　: Temperature of the center of the glass surface (Test point 5)
T1~ T4 : Temperature of each edge of the glass surface
T_{MAX} : The highest temperature of the glass surface

2. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S,TOPCON SR-3, ELDIM EZ-Contrast

(Ta = 25 $\pm$ 2°C, VDD=5V,   fv= 60Hz, f_{DCLK}=75MHz, I_L = 8 mArms)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		1,500	2,000	-		(1) SR-3
Response Time	G-to-G (Avg)	Tg		-	8	16		(3) RD-80S
Luminance of White (Center of screen)		Y_L	Normal θL,R=0 θU,D=0 Viewing Angle	450	500	-	cd/m^2	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.642	TYP. +0.03		(5),(6) SR-3
		Ry			0.330			
	Green	Gx			0.283			
		Gy			0.602			
	Blue	Bx			0.145			
		By			0.062			
	White	Wx			0.290			
		Wy			0.300			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10000	-	K	(5) SR-3
Viewing Angle	Hor.	θ_L	C/R$\geq$10	75	89	-	Degree	(6) EZ-Contrast
		θ_R		75	89	-		
	Ver.	θ_U		75	89	-		
		θ_D		75	89	-		
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between
40min and 60min after lighting the back light at the given temperature for stabilization
of the back light. This should be measured in the center of screen.

Inverter=62.5 (kHz $\pm$ 2.5kHz, Dimming : Max)
Environment condition : Ta = 25 $\pm$ 2 °C

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Photo detector	Field
SR-3	1°
RD-80S	2°

Photo detector

Field

SR-3 : 50㎝
RD-80S : 50㎝
EZ-Contrast : 0㎝

TFT - LCD Module

LCD Panel

The center of the screen

- Definition of test point

	228	683	1138
128	⑨	⑧	⑦
384	⑥	⑤	④
640	③	②	①

Active Area
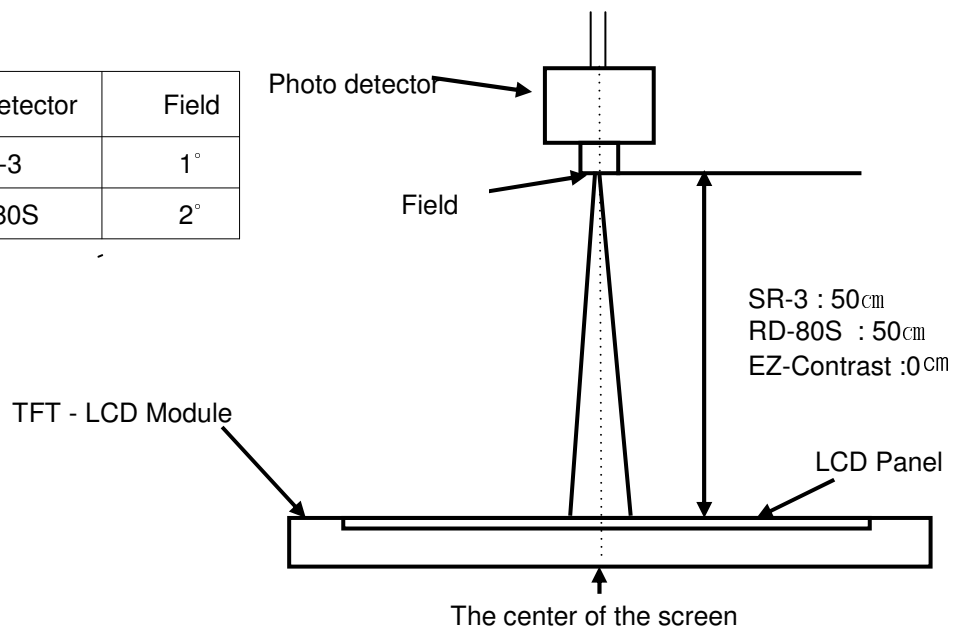
◯ Test Point
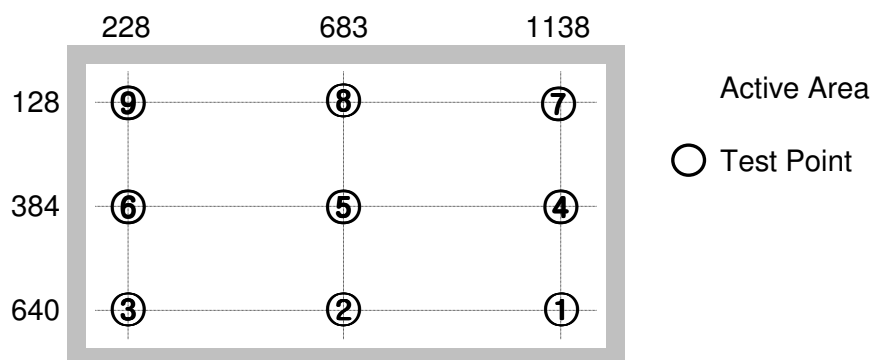
Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

| Display data | Black (data off) | White (data on) | Black (data off) |

Optical Instruments Response

100%
90%
10%
0%

T_R T_F
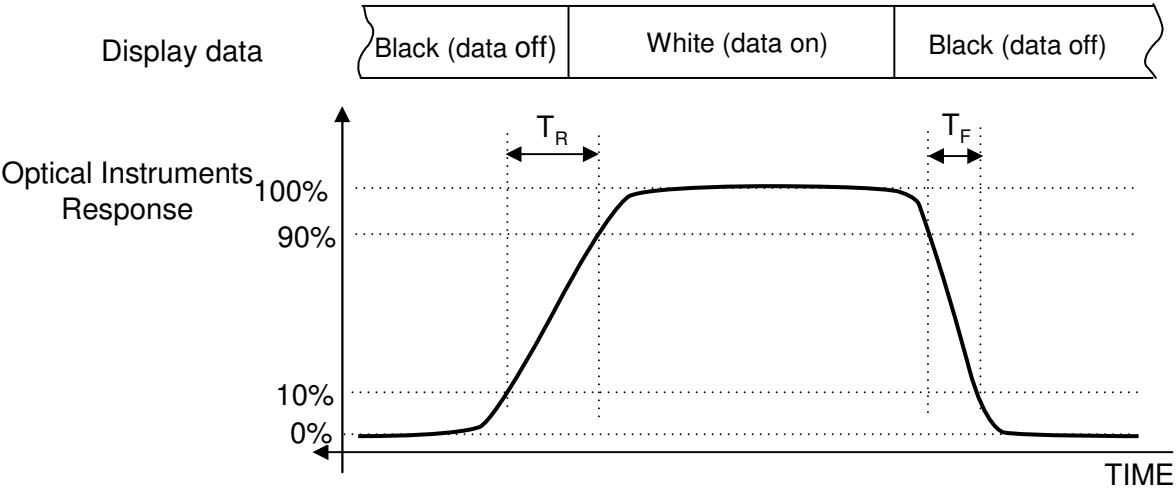
TIME

※ G-to-G : Average response time between Gray to gray (scale)

Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)

Θ_U
Θ_R
Θ_L
Θ_D
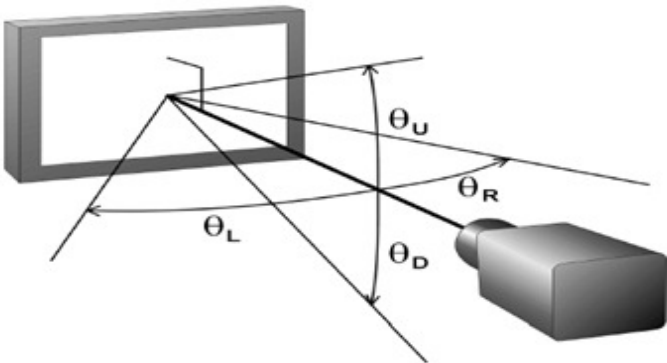
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3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

Ta = 25°C $\pm$ 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	4.5	5.0	5.5	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	1000	-	mA	(2),(3)
	(b) White		-	1400	-	mA	
	(c) N-Pattern		-	1500	2200	mA	
Vsync Frequency		f_V	48	60	66	Hz	
Hsync Frequency		f_H	44	48	53	kHz	
Main Frequency		f_{DCLK}	65	75	82	MHz	
Rush Current		I_{RUSH}	-	-	4	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.
(2) f_V=60Hz, f_{DCLK} = 75MHz, V_{DD} = 5.0V, DC Current.
(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern   b) White Pattern   c) N-Pattern
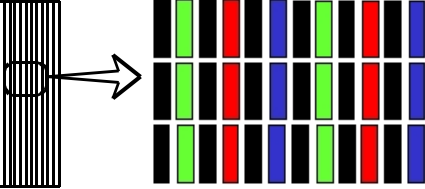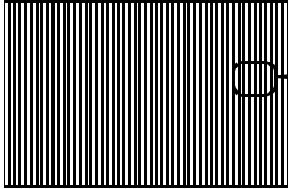
(4) Measurement Conditions

100%
90%
V_{DD}
10%
GND

T_{RUSH}=470μs
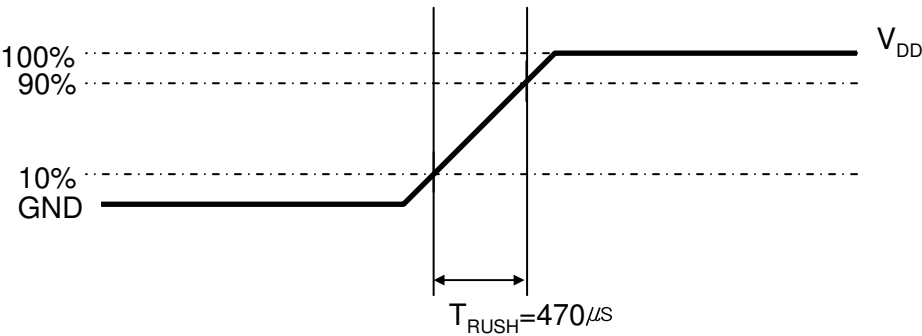
Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470μs.

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3.2 Back Light Unit

The back light unit contains 12 direct-lighting type CCFLs (Cold Cathode Fluorescent Lamp). The characteristics of lamps are shown in the following tables.

Ta=25 ± 2°C
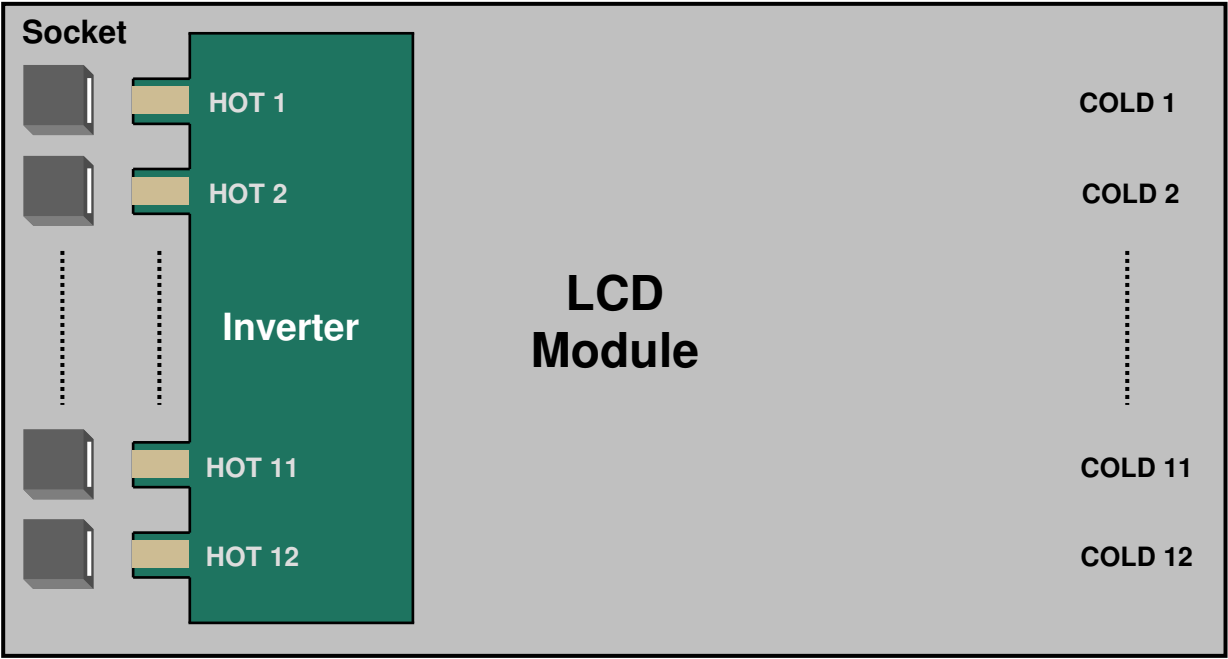
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	-	50,000	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : Ta = 25±2℃, I_L = 7.0mA , For single lamp only.]

3.3 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	23	24	25	V	Ta=25±2 ℃
Input Current	I_{RUSH}	Vin=24.0V Vdim=3.3V	-	-	7	Adc	Initial Turn-on
			-	4.1	5.5	Adc	Steady state
Lamp Current	I_O	Vdim=3.3 V	7.5	8.0	8.5	mArms	After 2 Hours Warm-Up @Vin=24V
Frequency	F_{LAMP}	Vin=24.0 V	60	62.5	65	kHz	
Backlight On/Off	ON	Vin=24.0 V	2.4	-	5.25	V	-
	OFF	Vin=24.0 V	0	-	0.8		
Dimming Control	V_{DIM}	Max Lum	3.3	-	-	V	-
		Min. Lum	-	-	0		

4. Block Diagram
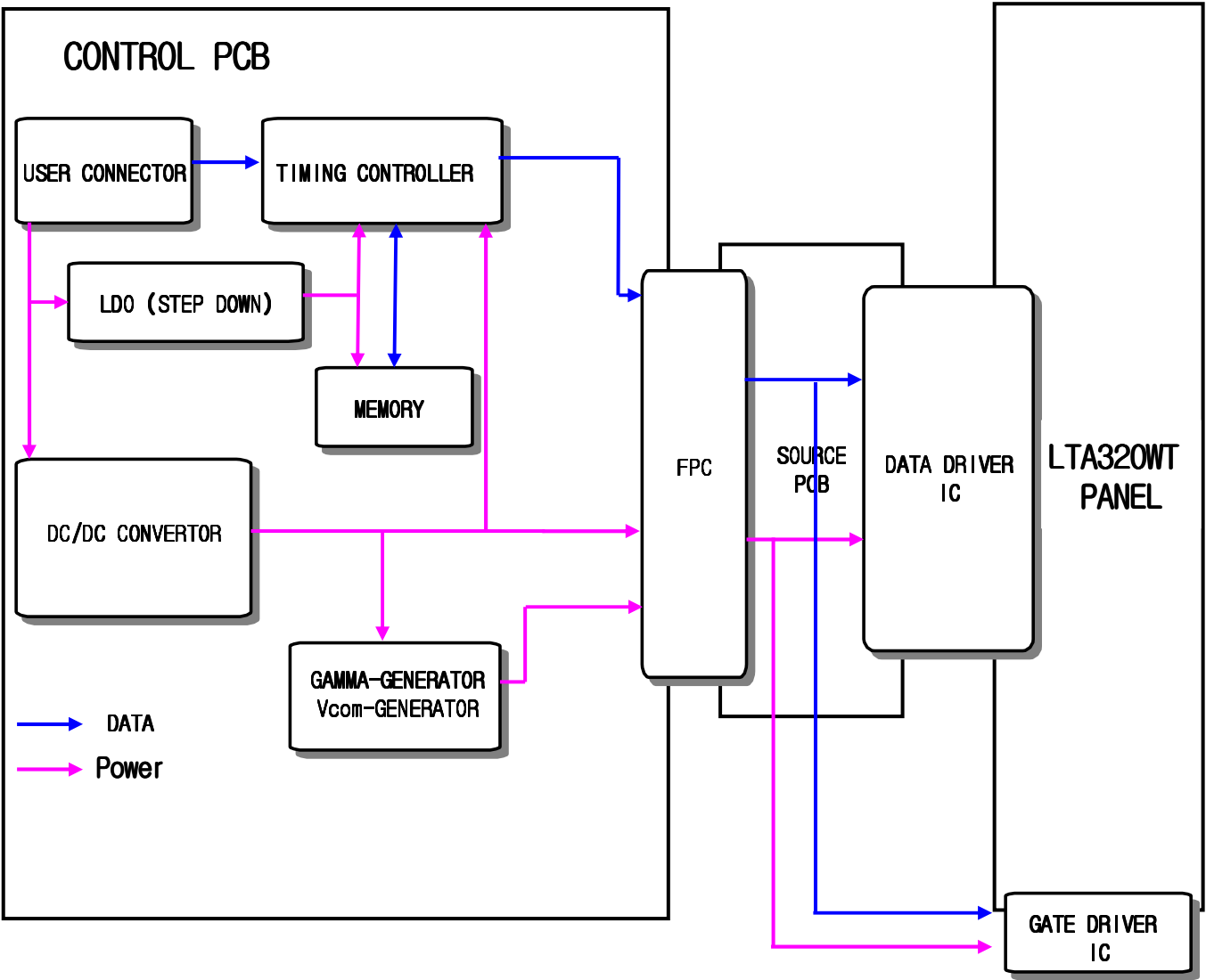
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5. Input Terminal Pin Assignment

5.1. Input Signal & Power   Connector : FI-E30S (JAE)

PIN No.	Description	PIN No.	Description
1	No Connection (Note1)	16	GND
2	No Connection (Note1)	17	RxIN3-
3	No Connection (Note1)	18	RxIN3+
4	GND	19	GND
5	RxIN0-	20	GND
6	RxIN0+	21	LVDS OPTION (Note 2)
7	GND	22	No Connection (Note1)
8	RxIN1-	23	GND
9	RxIN1+	24	GND
10	GND	25	GND
11	RxIN2-	26	Vin
12	RxIN2+	27	Vin
13	GND	28	Vin
14	RxCLK-	29	Vin
15	RxCLK+	30	Vin

Note1) No Connection: This PINS are only used for SAMSUNG internal using.
Note2) LVDS OPTION : If this PIN is HIGH (3.3 V) $\rightarrow$ Normal LVDS format
LOW (GND) $\rightarrow$ JEIDA LVDS format
SEQUENCE : On = V_{DD}(T1) $\geq$ LVDS Option $\geq$ Interface Signal(T2)
OFF = Interface Signal(T3) $\geq$ LVDS Option $\geq$ V_{DD}

Note(1) Pin number starts from Right side

PCB

▼

Pin No. 1   Pin No. 30

#1   #30

#1   #30
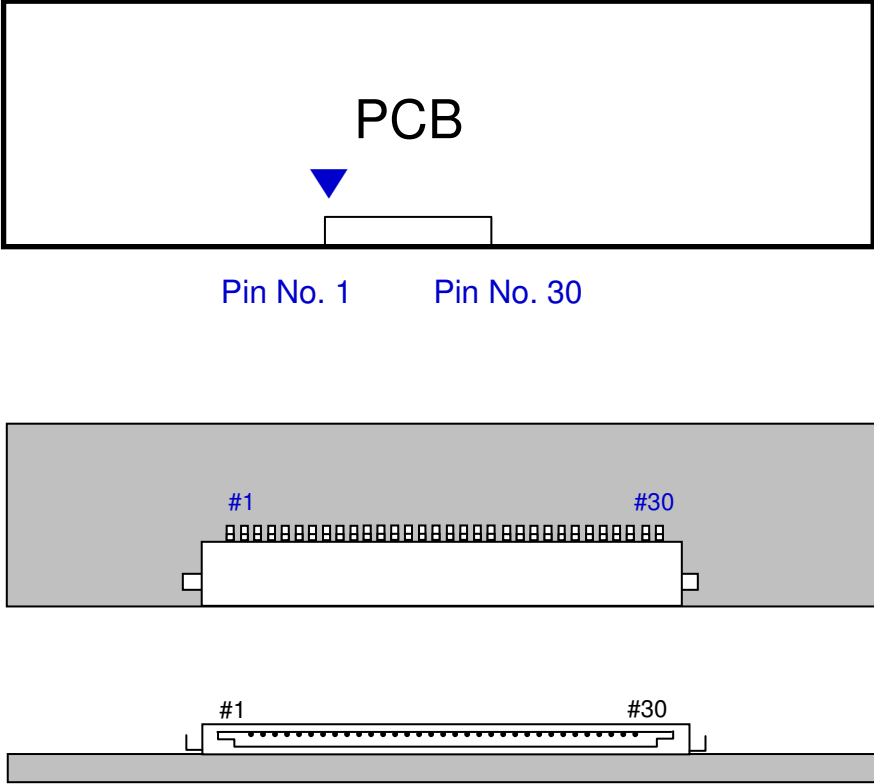
Fig. Connector diagram

a. Power GND pins should be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pin should be separated from other signal or power.

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5.2. Inverter Input Pin Configuration

Connector : S14B-PHA-SM-TB(LF) (JST)

Pin No.	Pin Configuration(FUNCTION)
1	24 V
2	24 V
3	24 V
4	24 V
5	24 V
6	GND
7	GND
8	GND
9	GND
10	GND
11	No Connection
12	Backlight On /Off [ON:2.4 - 5 V, OFF: 0 - 0.8 V]
13	Dimming Control [0V:Min, 3.3V:Max]
14	No Connection

5.3. Inverter Input Power Sequence

Vin (24V)

0.9 Vin   0.9 Vin

0.1 Vin   20msec [Min]

Dimming Control (0 ~ 3.3 V)

0.5sec [Min]   0.5sec [Min]

2.4V(On level)

Backlight On/Off   0.8V(Off level)

0.5sec [Min]   0.1sec [Min]
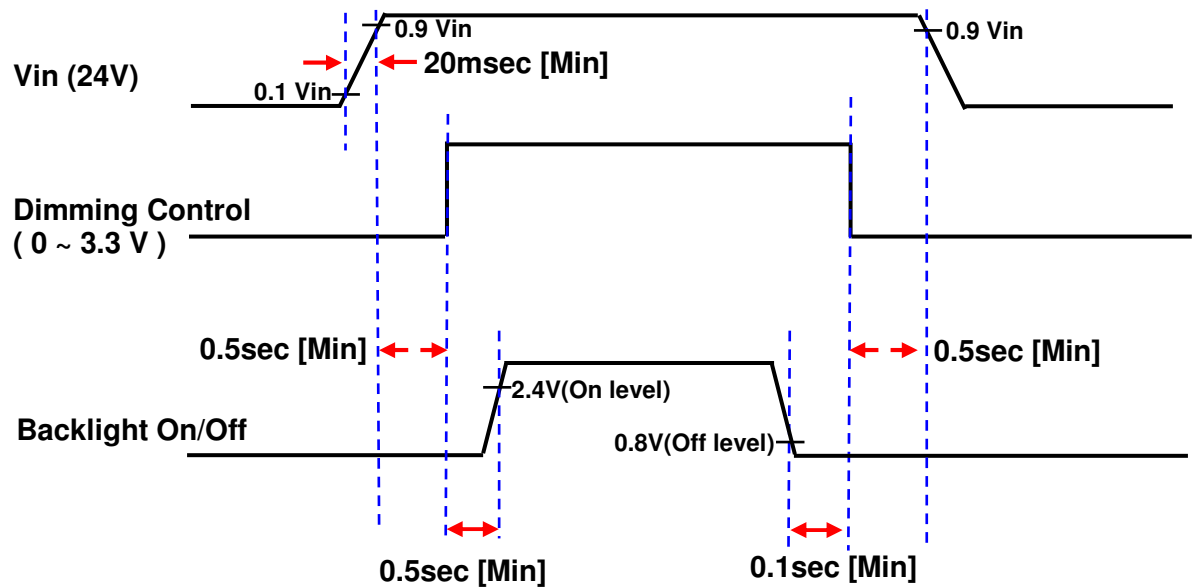
5.4 LVDS Interface
  - LVDS Receiver : Tcon (merged)
  - Data Format (JEIDA & Vesa)

	LVDS pin	JEIDA -DATA	VESA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

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5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	RED R0	R1	R2	R3	R4	R5	R6	R7	GREEN G0	G1	G2	G3	G4	G5	G6	G7	BLUE B0	B1	B2	B3	B4	B5	B6	B7	GRAY SCALE LEVEL
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R3~ R252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G3~ G252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B3~ B252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray :
Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)
Input Signal : 0 = Low level voltage, 1 = High level voltage

6. Interface Timing

6.1 Timing Parameters (DE only mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	65	75	82	MHz	-
Hsync		F_H	44	48	53	KHz	-
Vsync		F_V	48	60	66	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	768	-	lines	-
	Vertical Total	T_V	773	838	1200	lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1366	-	clocks	-
	Horizontal Total	T_H	1460	1600	2000	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does
not have an effect on normal operation.
(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
(2) Internal V_{DD} = 3.3V

6.2 Timing diagrams of interface signal (DE only mode)
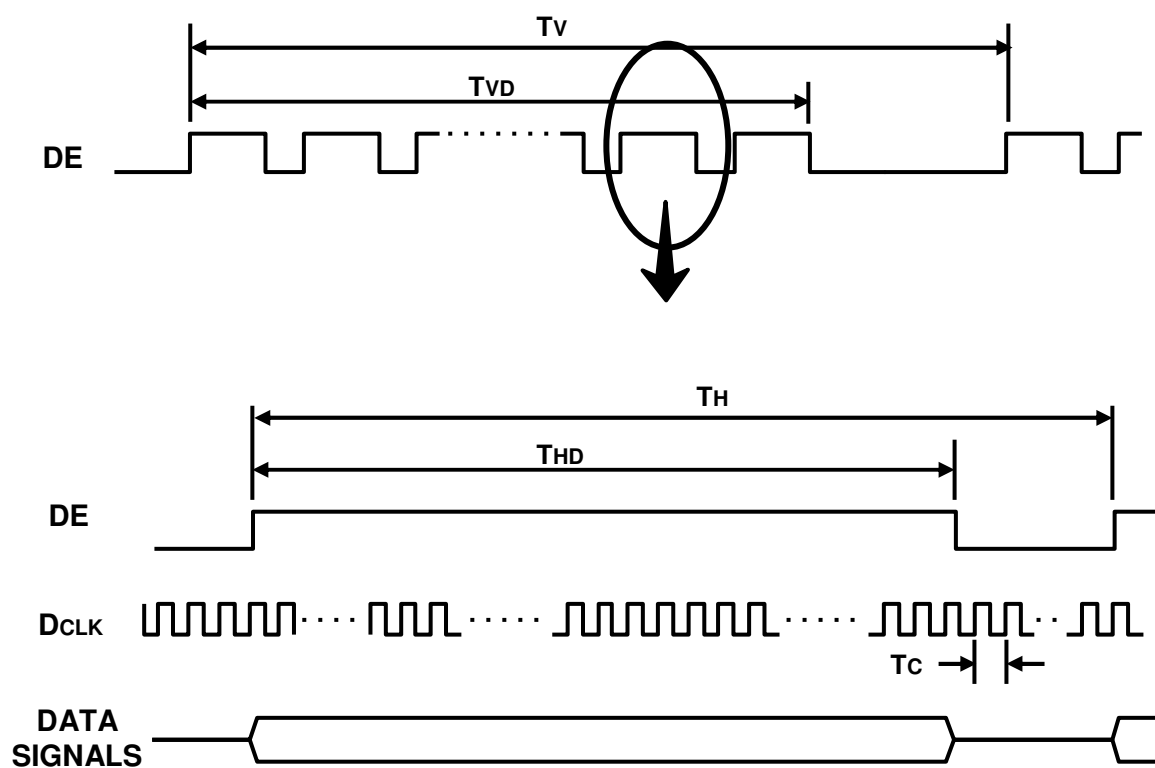
6.3 Power ON/OFF Sequence

   To prevent a latch-up or DC operation of the LCD Module, the power on/off
sequence should be as the diagram below.

T1 : V_{DD} rising time from 10% to 90%
T2 : The time from V_{DD} to valid data at power ON.
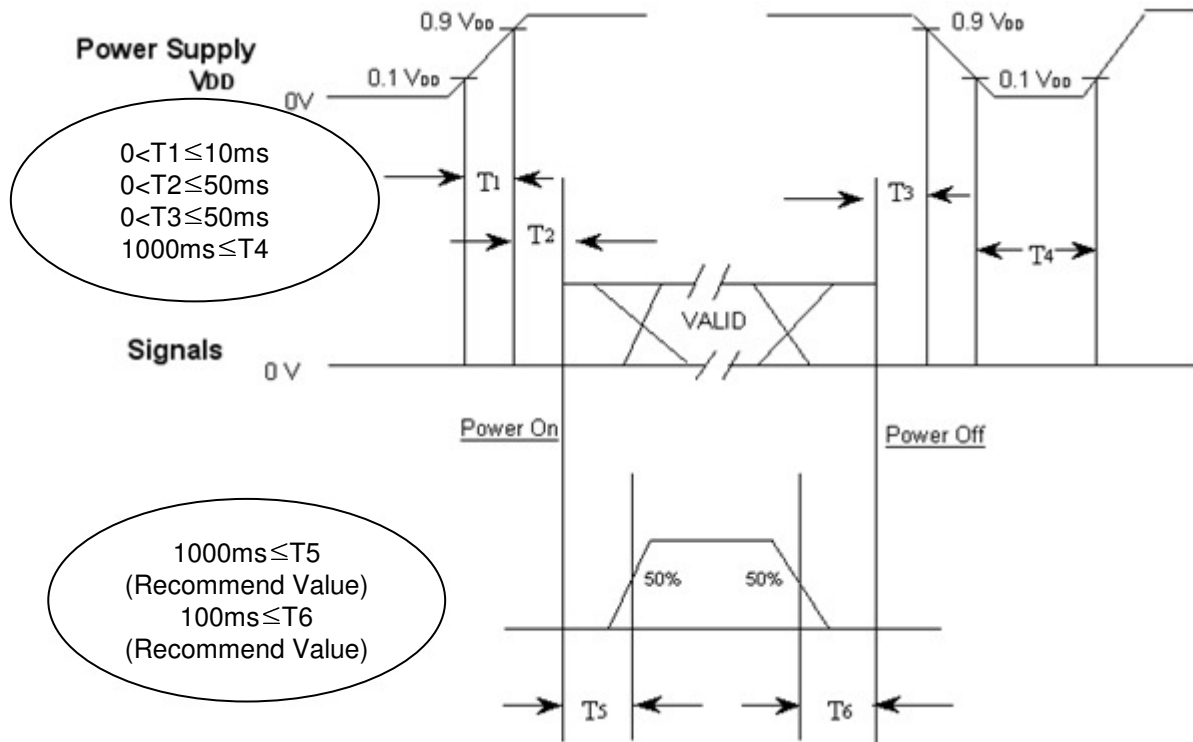T3 : The time from valid data off to V_{DD} off at power Off.
T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same
  as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on
  before the LCD operation or the LCD turns off before the back light turns off,
  the display may momentarily show abnormal screen.
- In case of V_{DD} = off level,
  please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off
  and on period.
- Interface signal should not be kept at high impedance when the power is on.

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7. Outline Dimension (Front View)

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
1	OUTLINE DIMENSION	–	LTA320WT-L05	1		

SECTION C-C'

SECTION B-B'

SECTION A-A'

2-M4,USERHOLE(DP 8mm MAX)
2-DP3mm MAX (USER HOLE GUIDE)
R2.5
210.4 ±1
MAX 44
Ø4
2-M4,DP 8mm MAX (USERHOLE)
2-M4,DP 8mm MAX (USERHOLE)
760±1 (OUTLINE)
(380)
368±0.5
368±0.5
4-Ø8.5
ACTIVE CENTER
392.256 (ACTIVE AREA)
398.4±1 (BEZEL OPENING)
213±0.5
450±1 (OUTLINE)
213±0.5
697.6845 (ACTIVE AREA)
703.6±1 (BEZEL OPENING)
(28.2)
3-18±0.5
171.5±0.5
171.5±0.5
11.3
6.1
15
2-Ø5
3-18±0.5
12
6.3
30
2-Ø5
144±0.5
144±0.5
210±0.5
210±0.5
2-25.5±0.5
15
15
102±0.5
102±0.5
365
2-M4,USERHOLE(DP 8mm MAX)
R2.5
2-M4,USERHOLE(DP 8mm MAX)
2-DP3mm MAX (USER HOLE GUIDE)
R2
2-32±0.5
41±1
2.5

* NOTES
1.BACKLIGHT : 12 COLD CATHODE FLUORESCENT LAMPS.
2.I/F CONNECTOR SPECIFICATION.
  - MAKER : JAE
  - PART NO. : FI-E30S
3.INVERTER CONNECTOR SPECIFICATION
  - MAKER : JST
  - PART NO : S14B-PHA-SM
4.UNSPECIFIED TORLERANCE TO BE ±0.5.
5.ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 8.0 MAX
6.CALIFERS MEASURING FORCE : 750 ±250 gf
7.GAP BETWEEN TOP CHASSIS AND GLASS IS 1.2 mm MAX
8.WEIGHT : 7.0 Kg (Max 7.5Kg)
9.BLACK MATRIX SPEC
  - |A - B| ≤ 2.0 mm
  - |C - D| ≤ 2.0 mm

BLACK MATRIX

PRELIMINARY

GENERAL TOLERANCE						
STEP	LEVEL 1	LEVEL 2	LEVEL 3			
0 < X <= 4	±0.05	±0.1	±0.2			
4 < X <= 16	±0.08	±0.15	± 0.3			
16 < X <= 64	± 0.12	± 0.25	± 0.5			
64 < X <= 256	± 0.25	± 0.4	± 0.8			

LEVEL 3

REV	DATE	DESCRIPTION OF REVISION				REASON	CHK'D BY
UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	MODEL NAME	LTA320WT-L05
SCALE	1/2		K,R,KO		J.H.CHN		
TOLERANCE			07.02.01		07.02.02	PART/SHEET NAME	OUTLINE DIM.(FRONT)	SHEET 1/2
LEVEL 3						SPEC. NO		
SAMSUNG ELECTRONICS						CODE NO.	–	VER. 000

7. Outline Dimension (Rear View)

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
	OUTLINE DIMENISON	—	LTA320WT-L05	1		

306.7

176

88

3-BEAD(HT=0.5mm)

REAR MOUNT 4x2-M4 (DP= 4mm)
4-LOCATION PIN BOSS Ø5(HT=1.5)
4-EMBOSS(HT=4mm)

(28.6)

(42)

22

4

DETAIL"A" (4PARTS)

'A'

LTA320WT-XXX
XXXX
XXXXXXXXXXX XXX
Made in Korea

(166.5)

333

122.85 ±1

130 ±1

LAMP SUPPORT AREA
HT MAX 3.5mm

190

190

271.6 ±1

PRELIMINARY

GENERAL TOLERANCE					REV	DATE	DESCRIPTION OF REVISION				REASON		CHG'D BY
STEP	LEVEL 1	LEVEL 2	LEVEL 3	UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	MODEL NAME	LTA320WT-L05		
0 < X ≤ 4	±0.05	±0.1	±0.2	SCALE	1/2		K.R.KO		J.H.CHUN				
4 < X ≤ 16	±0.08	±0.15	±0.3	TOLERANCE			07.02.01		07.02.02	PART/SHEET NAME	OUTLINE DIM.(REAR)	SHEET	2/2
16 < X ≤ 64	±0.12	±0.25	±0.5							SPEC. NO			
64 < X ≤ 256	±0.25	±0.4	±0.8	SAMSUNG ELECTRONICS						CODE NO.	—	VER.	000

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8. Reliability Test

Item	Test condition	Quantity
Temperature Step stress	-20 ~ 60℃, 10Cycle	4EA
HTOL	50℃ operation, 1000HR	8EA
LTOL	0℃ operation, 1000HR	4EA
HTS	70℃ storage, 500HR	4EA
LTS	-30℃ storage, 500HR	4EA
THB	40℃ / 95%RH, 500HR	4EA
WHTS	60℃ / 75%RH,, 500HR	4EA
T/C	-20 ℃ ~ 60 ℃, 200cycle	4EA
ESD	C D M : ±10 kV,150pF/330 Ω,9Point,3times/Point	3EA
ESD	Contact : ±8 kV ,150pF/330Ω ,100Point,1time/Point Non-contact : ±15 kV,200pF/100Ω ,100Point,1time/Point	Per 3EA
POWER ON/OFF	30sec(on) / 30sec(off) : 12,000 times	4EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	50G, 11msec, ±XYZ 1time/axis	3EA
Box Vibration	1.05Grms, Random, 1HR Z axis	1Box(20EA)
Box Drop	20cm, 1Angle, 3Edge, 6Face	1Box(20EA)

[Result Evaluation Criteria]
Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

* HTOL/ LTOL : High/Low Temperature Operating Life
** THB : Temperature Humidity Bias
*** HTS/LTS : High/Low Temperature Storage
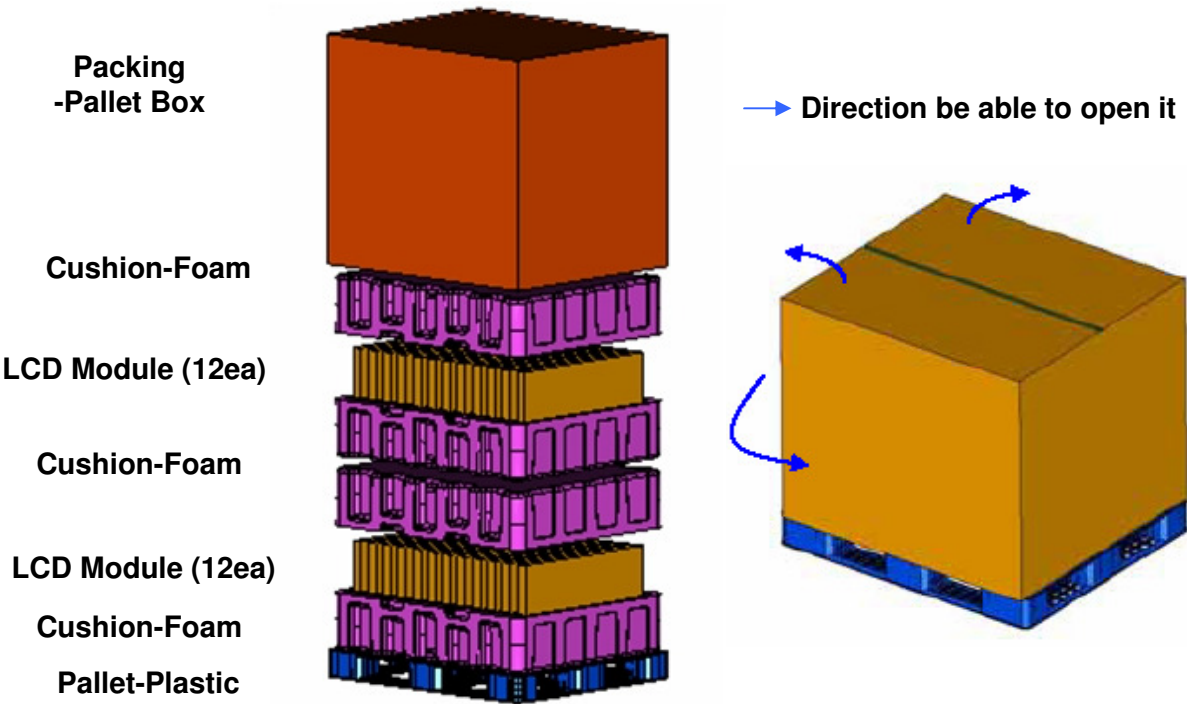**** WHTS : Wet High Temperature Storage

9. PACKING

9.1 CARTON (Internal Package)
  (1) Packing Form
      Corrugated fiberboard box and corrugated cardboard as shock absorber
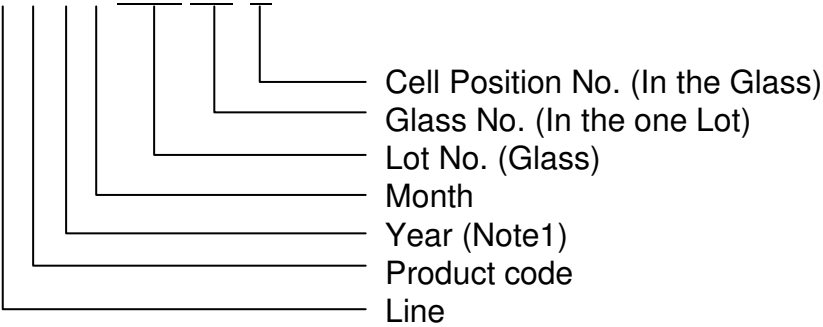 (2) Packing Method

Packing
-Pallet Box

➡ **Direction be able to open it**

Cushion-Foam

LCD Module (12ea)

Cushion-Foam

LCD Module (12ea)

Cushion-Foam

Pallet-Plastic

9.2 Packing Specification

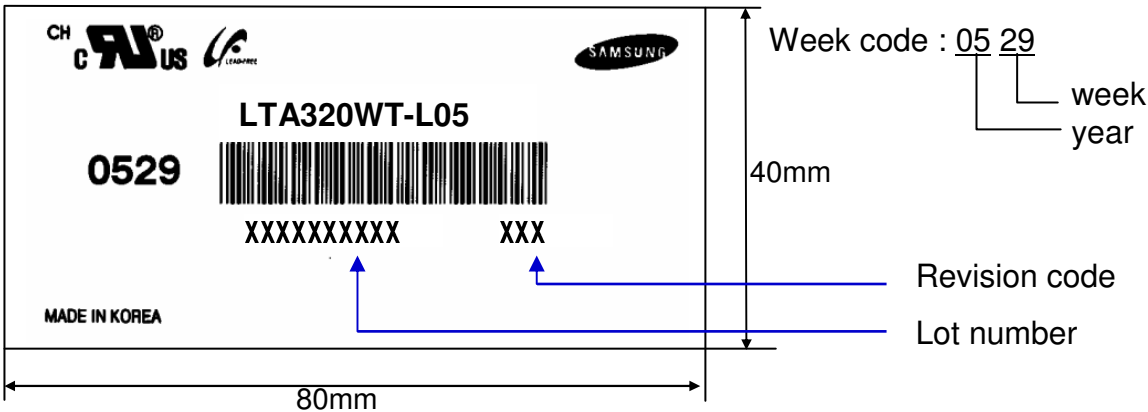| Item	Specification	Remark
LCD Packing	24ea / (Packing-Pallet Box)	1. 168 Kg / LCD (24ea) 2. 3.5 Kg / Cushion-SET (4ea) 3. 8.8 Kg / Packing-Pallet Box (1ea) 4. Cushion-pallet Material : EPS 5. Packing-Pallet Box Material : DW4
Pallet	1Box / Pallet	1. Pallet weight = 8kg 2. 8Kg/Pallet
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1150mm(H) x 985mm(V) x 1161mm(height)
Total Pallet Weight	198.8 kg	Pallet(8kg) + Module(7*24=168) + Cushion(4ea=14kg) + Pallet-BOX(8.8kg)

10. MARKING & OTHERS

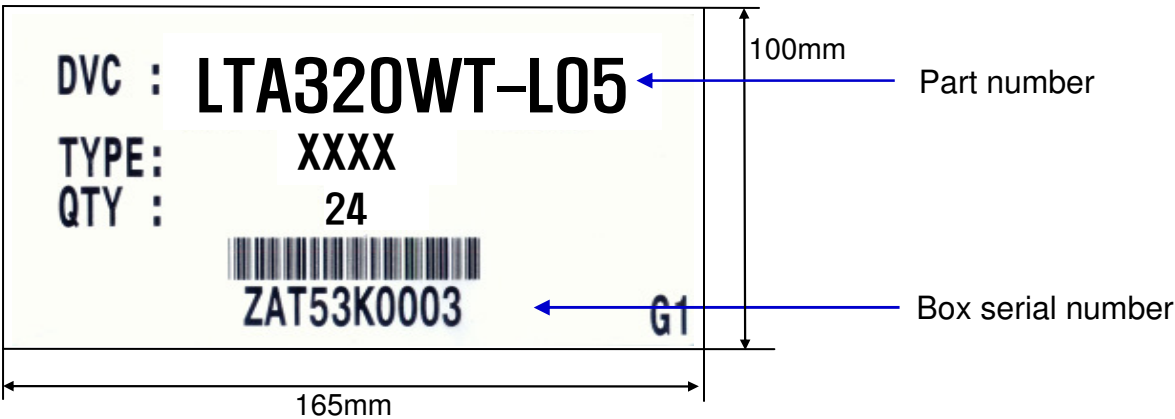A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTA320WT-L05
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X

```
                           └──── Cell Position No. (In the Glass)
                         └────── Glass No. (In the one Lot)
                       └──────── Lot No. (Glass)
                     └────────── Month
                   └──────────── Year (Note1)
                 └────────────── Product code
               └──────────────── Line
```

(4) Nameplate Indication

LTA320WT-L05

0529

XXXXXXXXX   XXX

MADE IN KOREA

SAMSUNG

40mm

80mm

Week code : 05 29
└── week
└── year

Revision code

Lot number

(5) Packing box attach

DVC : **LTA320WT-L05**
TYPE: **XXXX**
QTY :   **24**

ZAT53K0003   G1

100mm

Part number

Box serial number

165mm

(6) Others
  1. After service part
    Lamps cannot be replaced because of the narrow bezel structure.

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11. General Precautions

11.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and CCFL back light.

(d) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of inverter & LVDS board.

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module

(o) Pins of I/F connector should not be touched directly with bare hands.

11.2 Storage

(a) Do not leave the Module in high temperature, and high humidity for a long time.
It is highly recommended to store the Module with temperature from 0 to 35℃
and relative humidity of less than 70%.

(b) Do not store the TFT-LCD Module in direct sunlight.

(c) The Module should be stored in a dark place. It is prohibited to apply sunlight or
fluorescent light in storing.

11.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic
interference should be done by system manufacturers. Grounding and shielding methods
may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should
be connected directly with a minimized length. A longer cable between
the back light and the inverter may cause lower luminance of lamp(CCFL) and
may require higher startup voltage(Vs).

11.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20±15℃
- Humidity : 55±20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature,
humidity, display patterns or operation time etc.., It is strongly recommended
to contact SEC for Application engineering advice. Otherwise, its reliability and
function may not be guaranteed. Extreme conditions are commonly found at
Airports, Transit Stations, Banks, Stock market, and Controlling systems.

11.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection
   of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation,
   input voltage variation, variation in part contents and environmental temperature,
   and so on)
   Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time,
   the image may be "sticked" to the screen.
   To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled
   carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.